

RESEARCH ARTICLE

Seed Yield Response of Rapeseed Genotypes to Delayed Sowing under Karaj Environmental Conditions

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ABSTRACT

Tohidi-Nia, M. A., Aghaalkhani, M., Shirani Rad, A. H., Mokhtassi-Bidgoli, A., and Madani, H. 2020. Seed yield response of rapeseed genotypes to delayed sowing under Karaj environmental conditions. *Seed and Plant Journal* 36: 137-160 (in Persian).

To investigate the effect of delayed sowing on seed and oil yields of rapeseed (*Brassica napus* L.) genotypes, a field experiment was carried out at the research field station of Seed and Plant Improvement Institute, Karaj, Iran in 2015-2016 and 2016-2017 cropping seasons. The experimental design was split plot arrangements in randomized complete block design with three replications. Optimal sowing dates (02 October) and delayed sowing date (01 November) were assigned to the main plots, and 17 rapeseed genotypes [French (eight), Iranian (five), Hungarian (two) and German (two)] were randomized in sub-plots. Combined analysis of variance showed that all main and interactions effects were significant on all studied traits (except the main effect of year on seed oil content). Plant developmental stages experienced different environmental conditions due to delayed sowing and led to decreases in seed yield and yield components, seed oil yield and biological yield. The highest seed yield in optimal sowing date belonged to Garou (in the first year) and HL2012 (in the second year) genotypes with an average of 5240 and 5805 kg ha⁻¹, respectively. However, Okapi (in the first year) and Garou (in the second year) had the lowest seed yield in delayed sowing date with an average of 3624 and 2702 kg ha⁻¹, respectively. Lauren (in the first year) and Darko genotypes (in the second year) had the lowest grain yield reduction (%) in delayed sowing date which accounted for 21.5% and 35.9%, respectively.

Keywords: Canola, optimal sowing date, developmental stages, biological yield, seed oil content.

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RESEARCH ARTICLE

Evaluation of Drought Tolerance in Promising Barley Lines under Controlled and Field Conditions

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ABSTRACT

Dehghani, Z., Nikkhah, H. R., and Frouzesh, P. 2020. Evaluation of drought tolerance in promising barley lines under controlled and field conditions. *Seed and Plant Journal* 36: 161-182 (in Persian).

To evaluate the response of promising barley lines to drought stress, two experiments were carried out separately under controlled and field conditions. Under controlled conditions, 25 barley genotypes were tested at three levels of osmotic stress, zero (control), -5 and -10 MPa using polyethylene glycol 6000 using factorial arrangements in randomized complete block design with three replications. Analysis of variance, for this experiment, showed that the effects of genotype, osmotic potential and osmotic potential \times genotype interaction were significant on germination percentage, germination rate, coleoptile length, radical weight and seed vigor index. With increasing osmotic stress, all germination related traits significantly reduced. Under field conditions, 20 barley genotypes were evaluated using randomized complete block design with three replications, under two conditions; terminal drought stress (irrigation cut off at 50% heading) and non-stress in 2016-17 and 2017-2018 cropping seasons. Combined analysis of variance showed that there was significant ($P < 0.01$) difference among genotypes for grain yield in stress and non-stress conditions. Mean comparison under non-stress conditions showed that the highest grain yield belonged to genotype 16, and under drought stress conditions also genotypes 16 had the highest grain yield. In this experiment, different drought tolerance and susceptibility indices were calculated using grain yield data in stressed and non-stress conditions. Based on correlation between different indices and grain yield in two conditions, the mean productivity (MP), geometric mean productivity (GMP), stress tolerance index (STI) and harmonic mean (HM) were identified as the suitable indices. According to these indices, genotypes 16, 11 and 4 were identified as the superior genotypes in both conditions. Correlation analysis between traits at germination stage with different indices showed that only radicle weight had positive and significant relationship with MP, GMP, HM and STI indices.

Key Words: Barley, drought stress, germination, grain yield and drought tolerance indices.

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RESEARCH ARTICLE

Freezing Tolerance in Some Lentil Genotypes under Controlled Conditions

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ABSTRACT

Nabati, J., Nezami, A., Mirmiran, S. M., Hasanfard, A. R., Hojjat, S. S., and Bagheri, A. 2020. Freezing tolerance in some lentil genotypes under controlled conditions. *Seed and Plant Journal* 36: 183-205 (in Persian).

To study freezing tolerance of 40 genotypes of lentil (*Lens culinaris* Medik.) an experiment as factorial arrangements in completely randomized design with three replications was carried out at the research center for plant science, Ferdowsi University of Mashhad, Mashhad, Iran, in 2017-2018. Genotypes were exposed to three levels of freezing temperatures (-13, -15 and -18 °C). The results showed that at -13, -15 and -18 °C temperature levels, 100, 93 and 30 percent of genotypes had no significant difference with their maximum survival (100%), respectively. Only three genotypes MLC12, MLC17 and MLC95 were able to maintain 100% survival at all three freezing temperature levels. The lowest temperatures reducing 50% of leaf area (RLAT₅₀) and dry matter (RDMT₅₀) were -16.5 and -16.7 °C, respectively, and most of the genotypes succeeded in retaining 50 percentage of these traits during the recovery period. MLC8 and MLC286 genotypes with RDMT₅₀ of -16.7 °C had the highest ability to maintain dry weight, whereas MLC74 genotype with RDMT₅₀ of -13.4 °C had the least cold tolerance in respect to dry weight during recovery. Generally, 37 genotypes had reasonable level of tolerance to freezing stress. Therefore, based on the results of this experiment these 37 genotypes can be used in lentil breeding program for target areas with a minimum temperature of -15 °C.

Keywords: Lentil, survival, RDMT₅₀, RLAT₅₀, recovery period.

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RESEARCH ARTICLE

**Evaluation of Seed Yield Stability of Spring Rapeseed Genotypes Using
GGE Biplot Analysis**

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ABSTRACT

Amiri Oghan, H., Rameeh, V., Faraji, A., Fanaei, H. R., Kazerani, N. Kh., and Rahmanpour, S. 2020. Evaluation of seed yield stability of spring rapeseed genotypes using GGE biplot analysis. *Seed and Plant Journal* 36: 207-222 (in Persian).

The phenomenon of genotype \times environment interaction has important implications for selection of superior genotypes which remains as one of the main goals of crop breeding programs. To investigate the seed yield stability of promising spring rapeseed lines in four field stations in southern warm and dry and northern warm and humid agro-climatic zones of Iran. Sixteen open pollinated spring promising rapeseed lines were sown in randomized complete block design with three replications in two cropping cycles (2015-16 and 2016-17). Combined analysis of variance revealed that the effect of environment on seed yield was significant ($P < 0.01$). Genotype \times environment interaction effect was also significant ($P < 0.01$) on seed yield. GGE biplot analysis identified four mega-environments; Gorgan (Line G8), Sari (Line G4), Sari-Zabol (Line G13) and Zabol (Line G7). Lines G4 (Asa), G8 (Roshana) and G13 (Aram) with average seed yield of 2714, 3349 and 3817 kg ha⁻¹, respectively, had higher seed yield and yield stability. Line G4 had the highest seed yield stability. Line G11 (RGS003) with 2155 kg ha⁻¹ was identified as low yielding with low seed yield stability. Generally, grouping of spring rapeseed lines based on genotype \times environment interaction using GGE biplot analysis is a useful approach for selection and releasing of spring rapeseed cultivars with high seed yield potential and yield stability for target environments.

Keywords: Spring rapeseed, mega-environment, wide adaptation, specific adaptation.

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RESEARCH ARTICLE

Selection of Barley Genotypes for Warm Regions of Iran Using Stability Statistics and AMMI Analysis

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ABSTRACT

Barati, A., Lakzadeh, I., Jabbari, M., Poudineh, O., Alt Jafarby, J., Khanzadeh Ghara Aghajlosofla, H., and Kheirgoo, M. 2020. Selection of barley genotypes for warm regions of Iran using stability statistics and AMMI analysis. *Seed and Plant Journal* 36 (1): 223-240 (in Persian).

To identify barley promising lines with high and stable grain yield for warm regions of Iran, 17 barley lines as well as three check cultivars; Zahak (in South) or Sahra (in North), Nimrooz and WB-93-3 line were evaluated using randomized complete block design with three replications in five agricultural research field stations of Ahvaz, Darab, Zabol, Gonbad and Moghan, Iran, for two cropping seasons (2016-17 and 2017-18). Combined analysis of variance showed significant effects of genotype, year \times location, genotype \times location, genotype \times year and year \times location \times genotype on grain yield. For identifying genotypes with high and stable grain yields, mean rank, rank standard deviation, non-parametric statistics; S_i^1 , S_i^2 , S_i^3 , S_i^6 , NP_i^1 , NP_i^2 , NP_i^3 , NP_i^4 , and parametric statistics; coefficient of variance, Shukla's stability variance, Wricke's ecovalence, Kang's rank-sum and AMMI analysis methods were used. According to the results, lines no. 3 (Dasht/Ebc(a)/Badia/3/Sahra) and line no. 4 (Dasht/Ebc(a)/Badia/3/Nik) in the southern warm and dry regions, and line no. 9 (Violeta/Mja/Manal/Alanda-01) in northern warm and humid regions of Iran were identified as superior lines which can be released as new commercial cultivars, and also be used as parents in the national barley breeding programs.

Key words: Barley, mean rank, grain yield, yield stability, stability analysis.

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RESEARCH ARTICLE

Seed Yield Response of Faba Bean (*Vicia faba* L.) Genotypes to Drought Stress

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ABSTRACT

Memari, M., Dadashi, M. R. Sheikh, F., and Faghani, E. 2020. Seed yield response of faba bean (*Vicia faba* L.) genotypes to drought stress. *Seed and Plant* 36: 241-254 (in Persian).

The response of seed yield and its components of 21 faba bean genotypes to drought stress was assessed using randomized complete block design with three replications, under two moisture environments; non stress (optimum irrigation) and drought stress (cut off of irrigation from commencement of flowering) and in two cropping seasons (2016-17 and 2018-19) at Gorgan agricultural research station, Gorgan, Iran. Combined analysis of variance showed that moisture environment had significant effect on all studied traits except 100-seed weight. Drought stress caused reduction in seed and biological yields as well as harvest index by 59.71%, 31.81% and 41.92%, respectively. Genotypes; G-Faba-66, G-Faba-65, G-Faba-62, G-Faba-294, G-Faba-292, G-Faba-523, G-Faba-525 and G-Faba-21, under non stress conditions (optimum irrigation), and G-Faba-67, G-Faba-66, G-Faba-75, G-Faba-72, G-Faba-65 and G-Faba-62, under drought stress conditions, had the highest seed yield, respectively. G-Faba-67 showed the highest level of tolerance to drought stress considering seed yield, number of seed pod⁻¹ and harvest index.

Keywords: Faba bean, harvest index, optimum irrigation, pod length, biological yield.

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